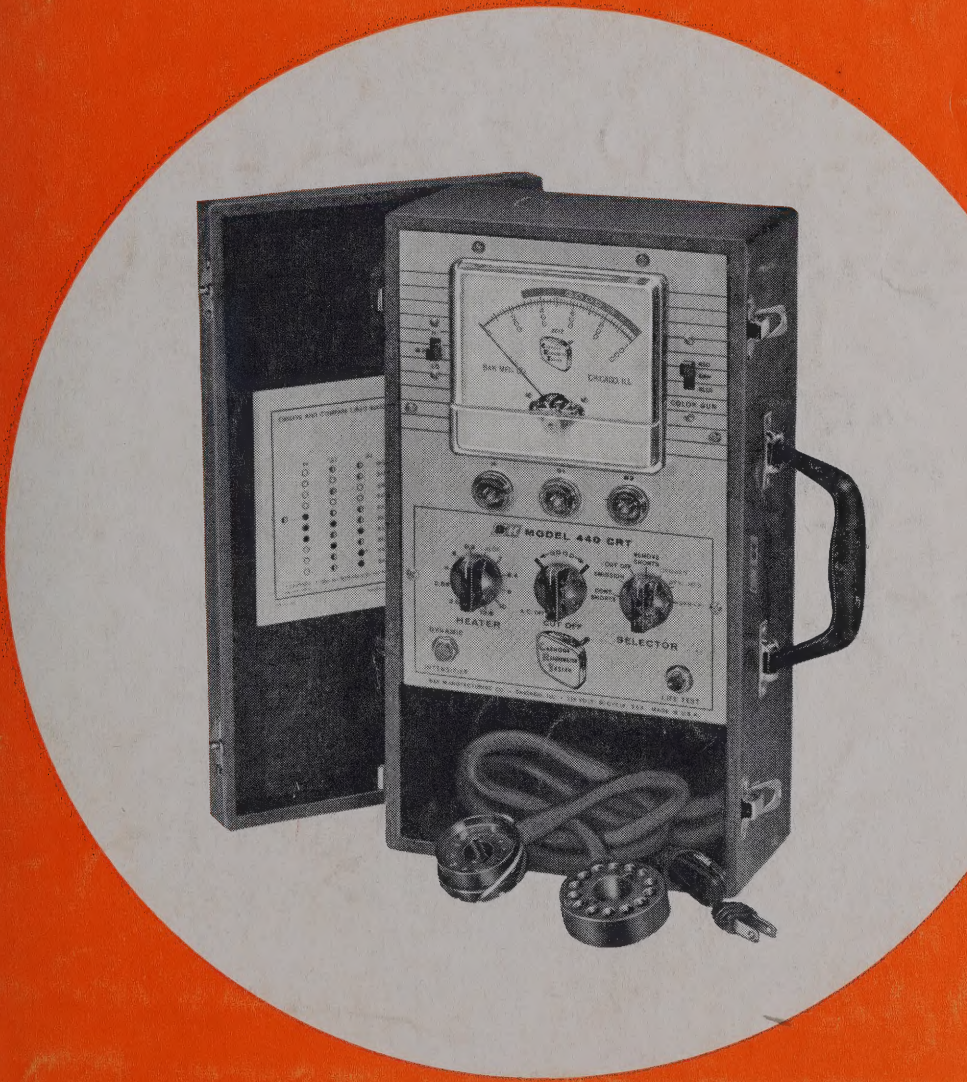
CRT Model 440

CATHODE REJUVENATOR TESTER

B&K

INSTRUCTION MANUAL



B & K MANUFACTURING COMPANY
1801 W. BELLE PLAINE AVENUE, CHICAGO 13, ILLINOIS

OPERATING INSTRUCTIONS

FOR YOUR

Model 440

CATHODE REJUVENATOR TESTER

B & K MANUFACTURING COMPANY
1801 West Belle Plaine Avenue
Chicago 13, Illinois

INFORMATION ON YOUR MODEL 440 CATHODE REJUVENATOR TESTER

What It Will Do

1. The Cathode Rejuvenator Tester (CRT) will test a cathode ray tube for all of the important factors which determine the quality of the tube. The Cathode Rejuvenator Tester will check for continuity between the base pins and the elements within the tube, and also for shorts or leakage between the elements in the tube (up to several megohms). Not only will the tester check for shorts, but it will actually determine which elements are shorted together within the tube.

2. The tester will check for the amount of emission from the cathode of the tube.

3. The tester will check the cutoff characteristics of a tube.

4. Your Cathode Rejuvenator Tester will also repair most of the common faults in cathode ray tubes, such as shorts between elements, open connections to elements, and inter-element leakage.

5. Your CRT will rejuvenate picture tubes which have low emission.

6. Your new Cathode Rejuvenator Tester will also predict the probable useful life of the picture tube.

7. Your Cathode Rejuvenator Tester will perform all of the above tests and repairs on the new 110° tubes, including the "low G2" tubes.

8. Your Cathode Rejuvenator Tester will also perform all of the above tests on color picture tubes, testing and rejuvenating each gun separately.

CONTROLS:—*What They Do*

The following operating controls and indicators are provided on the front panel of the Model 440 Cathode Rejuvenator Tester. (See Fig. 1).

1. HEATER SWITCH. This switch allows adjustment of the heater voltage applied to the tube being tested. With the number of voltages provided, it effectively assures the owner against obsolescence of the instrument.

2. CUT-OFF. This control is used to determine if the tube under test will cut off with the proper grid voltage. This control is also the ON-OFF switch. When turned completely counter clockwise, the power is off.

3. SELECTOR SWITCH. This switch determines which of the various functions and tests are being used.

4. DYNAMIC INTENSIFIER. This push-button switch is used to burn out shorts and repair open elements, when the Selector Switch is in the Remove Short position. Also it is used to rejuvenate weak emission in the Dyn Lo, Dyn Med, and Dyn Hi positions.

5. LIFE TEST. This push-button switch is used to determine the probable useful life of a picture tube.

6. COLOR GUN. This 3-position slide switch permits separate tests and rejuvenation of each of the three guns. (Red, Green and Blue). of a color TV picture tube.

7. G2 SWITCH. This switch permits proper testing of the class of picture tubes which are designed to operate with only a 50 volt potential between the control grid and first anode (G2).

8. INDICATORS H-G-G2. These lights will indicate element continuity and shorts in a picture tube.

GENERAL INFORMATION ON THE MODEL 440 CATHODE REJUVENATOR TESTER

The Cathode Rejuvenator Tester is designed for use on 110 volts 50/60 cycles AC only. Do not use on any other type of current.

Before attaching the socket to the picture tube, the correct filament voltage must be set on the HEATER switch. The greatest majority of picture tubes in use today use 6.3 volts for the heater. However, in the last few years there have been a few tube types which use other heater voltages. We have listed on the chart those tubes which have filament voltages which are other than 6.3 volts. You can assume that if a tube is not listed on the chart, that it is tested in the regular socket at 6.3 volts.

The chart also lists those tubes which have bases which are different than the standard duo decal base (e.g.—narrow neck 110° tube). These tubes are tested by using one of the accessory sockets A, B or C which plug into the standard or regular socket, and then fit directly on the base of the tube.

The multiplicity of bases and heater voltages available with this instrument practically guarantee it against obsolescence for many years to come. In the future, if a new 130° 12.6 volt picture tube with a different basing is used, a simple new accessory socket will be made available to test it and the HEATER switch would take care of the different filament voltage.

There are a few picture tubes which operate with only a 50 volt potential between the control grid and the first anode (G2). These tubes are listed on the chart also as LO-G2, and these must be tested with the "G2" front panel switch in the "Lo" position. All other tubes are tested with the "G2" switch in "Hi" position.

HOW TO TEST A CATHODE RAY TUBE WITH YOUR MODEL 440 CATHODE REJUVENATOR TESTER

Preparing To Test

1. Plug the unit into the AC current and turn it on with the power switch located on the CUTOFF control.
2. Set the heater switch to the proper voltage. If the tube type has a standard duo decal base and is not listed on the chart, use 6.3 V.
3. Refer to chart to determine correct G-2 Switch position. If not listed on chart put Switch in Hi G-2 position.

Continuity And Shorts Test

Turn the selector switch to Continuity-Short position. In this position, you are checking the continuity of all of the elements. Also, if there are any shorts between these elements, they will immediately show up in this position.

OBSERVE AND COMPARE LIGHT BULBS

● Light On
○ Light Off
◐ Half Lighted
(does not make any difference which half lights up)

	H	G1	G2		
	○	◐	◐	GOOD	
	○	○	◐	BAD	Open G1 (Control Grid)
	○	◐	○	BAD	Open G2 (First Anode)
	○	○	○	BAD	Open K (Cathode) or Low Emission
◐ or	●	◐	◐	BAD	Short H-K
	●	●	◐	BAD	Short H-G1
	●	◐	●	BAD	Short H-G2
	○	●	◐	BAD	Short G1-K
	○	◐	●	BAD	Short G2-K, or G1-G2

In an effort to provide you with the maximum sensitivity on open and short tests, the G2 neon lamp has a tendency to glow very slightly in the base. This is a normal occurrence and in no way affects the accuracy of its indication.

Notice that by reading the three bulbs and comparing them, you can immediately show any open connections or shorts between elements within the tube, and determine exactly which elements are shorted. If a tube shows no open connections or shorts go on to test the tube in the emission position. If there is a short in the tube, refer to later section on removing shorts. Tap the tube lightly while making this test. It is possible for one or more of the neon indicators to flicker. This would indicate an intermittant connection within the tube. Refer to Section on repairing open elements. It is possible that a tube will show an open cathode (K) or an open G2 even though there is no "open," if the emission of the cathode is extremely low. (Refer to the section on restoring emission).

Emission Test

To test for emission, turn the Selector Switch to the EMISSION position. In this position you test for the electron emission capabilities of the cathode. This is a measure of the quality of the tube. If the meter reads over 300 in the "good" area of the scale, the tube is good. If the meter reads below 300, the tube cathode emission is low. If the emission is low, refer to the following section on restoring emission of the tube.

CAUTION:—Before testing for emission, determine from the chart if the tube being tested uses a low G2 voltage, such as 14AUP4, 21CXP4 and 24AJP4, etc. If a low G2 voltage is required set "G2" switch to LO position. Failure to use LO G2 voltage on tubes which require it may result in the beam current rising to a value which may destroy the tube.

CUTOFF TEST

The contrast range of a cathode ray tube is directly related to the cutoff characteristic. The lower the bias voltage needed to cut off the tube, the greater will be the contrast of the picture on that tube.

To check the cutoff characteristic, turn the Selector Switch to the CUTOFF position. Rotate the cutoff control until the meter reads at the "Cutoff" line on the meter scale. (This is one division above the zero mark on the meter scale.) If the Cutoff control pointer reads within the "good" range, the cut off characteristic of the tube is good. If the cutoff reading is higher (the pointer is out of the "good" range in a counter-clockwise direction), the tube may still be a usable tube if the emission current is exceptionally high. If the emission current is low and the cutoff characteristic does not fall within the "good" range, the tube is "bad."

LIFE TEST—How to Test the Picture Tube for Life Expectancy

The useful life of a picture tube can be approximately predicted by the mass of emitting material that is on the cathode of the picture tube, and also by the amount of gas present in the tube. To test for the life of a tube, put the Selector switch in the Emission position. Press the Life Test button while watching the Emission meter. The emission current will go down slowly until zero current is shown on the meter. The speed at which the meter falls to zero, determines

the expected life of the tube. If the meter reading falls rapidly to zero, there is probably a lot of gas in the tube, or there is only a small mass of active emitting surface left, and therefore the tube cannot be expected to last much longer. (A gassy picture tube cannot be repaired.) A serviceman, by practicing on a few new and gassy tubes, will soon be able to determine which is the correct speed of the meter.

Testing Color Tubes

For color tubes, use the color tube socket. Color TV tubes are tested exactly like a black and white tube, except that each of the three guns are tested separately. The color gun switch switches into the circuit only one gun at a time. The switch is labeled Red-Grn-Blue for the Red Gun, Green Gun and Blue Gun respectively.

The 440 CRT has been specifically designed so that the color tube emission meter reading is calibrated on the same Good-Reject scale as for black and white tubes. A new color tube gun will read approximately 900 to 1000 on the meter (a very "hot" tube may read off scale slightly but it will not damage the meter). When the reading on any gun is below 300 that gun is too low in emission to be usable.

In testing color TV tubes it is important to keep in mind that it is the relationship between the three guns (Red-Green-Blue) which determine the quality of the picture. It is true that the screen voltage and back-ground controls for the three separate guns can compensate for some differences. However, when the emission characteristic of one gun as tested on the instrument is substantially different from the emission of the other two guns, then it may be impossible to compensate for this difference and the tube may not be usable any longer. Any attempt to bring back the emission by rejuvenating a color tube gun should be done very cautiously, and only after it has been definitely determined that the tube is no longer useful in its present condition. Follow the same procedure as for rejuvenating a black and white tube. Make sure you attempt rejuvenation of the defective gun only.

Marked *differences* between the three guns in the rate of "slump" during the "Life Test" indicates that the color tube may not respond to the color signals as originally intended. It must be kept in mind that the most critical use of a color picture tube is on black and white pictures where all three guns must respond the same amount simultaneously in order to properly reproduce white.

How to Repair Cathode Ray Tubes with Your Cathode Rejuvenator Tester

If the tube in the Short test showed a cathode to filament short, do not attempt to repair it.

If the picture tube has good emission and life test results, but has a H-K short it may operate satisfactorily in the Receiver. This depends on the filament wiring of the TV set. If the tube works all right in the set it is unnecessary to

do any more to it. However, if the picture is bad (possibly hum in picture or no control of brightness) then the picture tube can still be used if a 1:1 filament isolation transformer is wired into the set.

Removing Inter-Element Shorts in a Cathode Ray Tube

Turn Selector switch to "REMOVE SHORTS" position. Wait 30 seconds and then depress DYNAMIC INTENSIFIER button for several seconds. An arc should develop between the shorted elements and if successful, you should be able to burn out the short with this arc. After each attempt at removing shorts, test the tube for shorts again. If after attempting to clear shorts you have not successfully done so, there is nothing more that can be done to the tube.

After each attempt at removing shorts, test the tube for shorts again. Once the tube has been successfully repaired do not try to get more out of a tube by rejuvenating it again as you may destroy the cathode surface. After burning out the shorts, test the tube in the emission position again for proper amount of cathode emission. If you have properly burned out the short and the emission is good, you have a tube which is practically as good as a new tube.

RESTORING EMISSION

To re-activate the cathode of a picture tube, set the Selector switch in the Dynamic Intensifier-Lo position. Wait 15 seconds. Press the red Dynamic Intensifier button momentarily. (Caution: Do not hold down the button over 1 second.) After the tube has been rejuvenated in this position, turn to Emission position on the Selector switch and check the emission current of the tube again. While the Dynamic Intensifier button is depressed one or more of the short-continuity neon lamps may flicker. This is a normal occurrence and may be disregarded.

If the emission current is over 300 you have satisfactorily completed the rejuvenation of this picture tube. Once the tube has been successfully rejuvenated, do not try to get more out of the tube by rejuvenating it again as you may destroy the cathode surface. Another Life Test should be made to make sure that there is no excess gas present in the tube.

If the meter still does not read 300 or better, turn the Selector switch to Dynamic Intensifier-Med position—wait 15 seconds—and press the Dynamic Intensifier button momentarily. Go back to the Emission Test position and test the tube again. If the current is now satisfactory, you have completed the rejuvenation. If it is still low, try in the Dynamic Intensifier-Hi position—wait 15 seconds—and press the Dynamic Intensifier button again and rejuvenate the tube in this position. Then test the tube once again. If you cannot bring the emission current up by using the Dynamic Intensifier-Hi position, the tube cannot be repaired and no attempt should be made to do any more to that tube. Any additional attempts at repairing the tube (i.e. increasing the grid opening to increase emission) will have an undesirable effect upon the operation of the tube in the TV set and should not be attempted. NOTE: If you have a

B & K Model 440 Parts and Price List

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART No.	DEALER'S NET
C-1	5 MFD 250 V Electrolytic Cap.	CL-5-250	$ .73
C-2	0.1 MFD 1000 V Tubular Capacitor	CP-A1-1000	.38
M-1	Function Switch	S-40	2.10
M-2	Heater Switch	S-7	1.38
M-3	High-Low Emission Switch	S-22	.15
M-4	Red-Green-Blue Gun Selector Switch	S-3	.35
M-5	Dyna Intensifier Switch, 1 Pole 1 Pos. Normally Open (Red Button)	S-17	1.08
M-6	Life Test Switch, 1 Pole, 1 Pos. Normally Closed (Black Button)	S-19	.99
M-7	"H" Indicator. Ne-48 Neon Lamp	PL-7	.70
M-8	"G1" Indicator. NE-48 Neon Lamp	PL-7	.70
M-9	"G2" Indicator. NE-48 Neon Lamp	PL-7	.70
M-10	Meter	ME-7	12.60
R-1	220 K Ohm ½ W 10% Resistor	RC-224-A-10	.09
R-2	4.7 K Ohm 1 W 10% Resistor	RC-472-B-10	.09
R-3	150 K Ohm ½ W 10% Resistor	RC-154-A-10	.09
R-4	500K Ohm Cut off Bias Control with On-Off Switch	P-45	.91
R-5	560 K Ohm ½ W 10% Resistor	RC-564-A-10	.09
R-6	10 K 1 W 10% Resistor	RC-103-B-10	.09
R-7	1 Megohm ½ W 10% Resistor	RC-105-A-10	.09
R-8	56 K Ohm 7 W 10% Glass Resistor	RG-563-7-10	.45
R-9	220 K Ohm ½ W 10% Resistor	RC-224-A-10	.09
R-10	10 K Ohm ½ W 10% Resistor	RC-103-A-10	.09
R-11	47 K Ohm ½ W 10% Resistor	RC-473-A-10	.09
R-12	47 K Ohm ½ W 10% Resistor	RC-473-A-10	.09
T-1	Transformer, Heater	TF-2	5.76
T-2	Transformer, High Voltage	TP-12	3.75
V-1	6X4 Tube	V-6X4	.92

MISCELLANEOUS PARTS

Test Socket "A"	ASM-34	1.95
Test Socket "B"	ASM-35	1.95
Test Socket "C"	ASM-36	1.95
Duo-Decal Socket and Cable Assembly, Regular	G-28	1.53
Neo-Diheptal Socket and Cable Assembly, Color	G-29	2.91
AC Line Cord	W-14	.33
Knob	K-7	.15
Carrying Case	LG-4	7.50
Lens Cap and Bushing	LS-8	.69
Neon Indicator Socket Assembly	LS-10	1.20
7 Pin Socket	G-7PF	.12
Carton and Fillers	PKG-32	.67
Instruction Manual	PM-41	.18

(Prices subject to change without notice.)

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do any more to it. However, if the picture is bad (possibly hum in picture or no control of brightness) then the picture tube can still be used if a 1:1 filament isolation transformer is wired into the set.

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After each attempt at removing shorts, test the tube for shorts again. Once the tube has been successfully repaired do not try to get more out of a tube by rejuvenating it again as you may destroy the cathode surface. After burning out the shorts, test the tube in the emission position again for proper amount of cathode emission. If you have properly burned out the short and the emission is good, you have a tube which is practically as good as a new tube.

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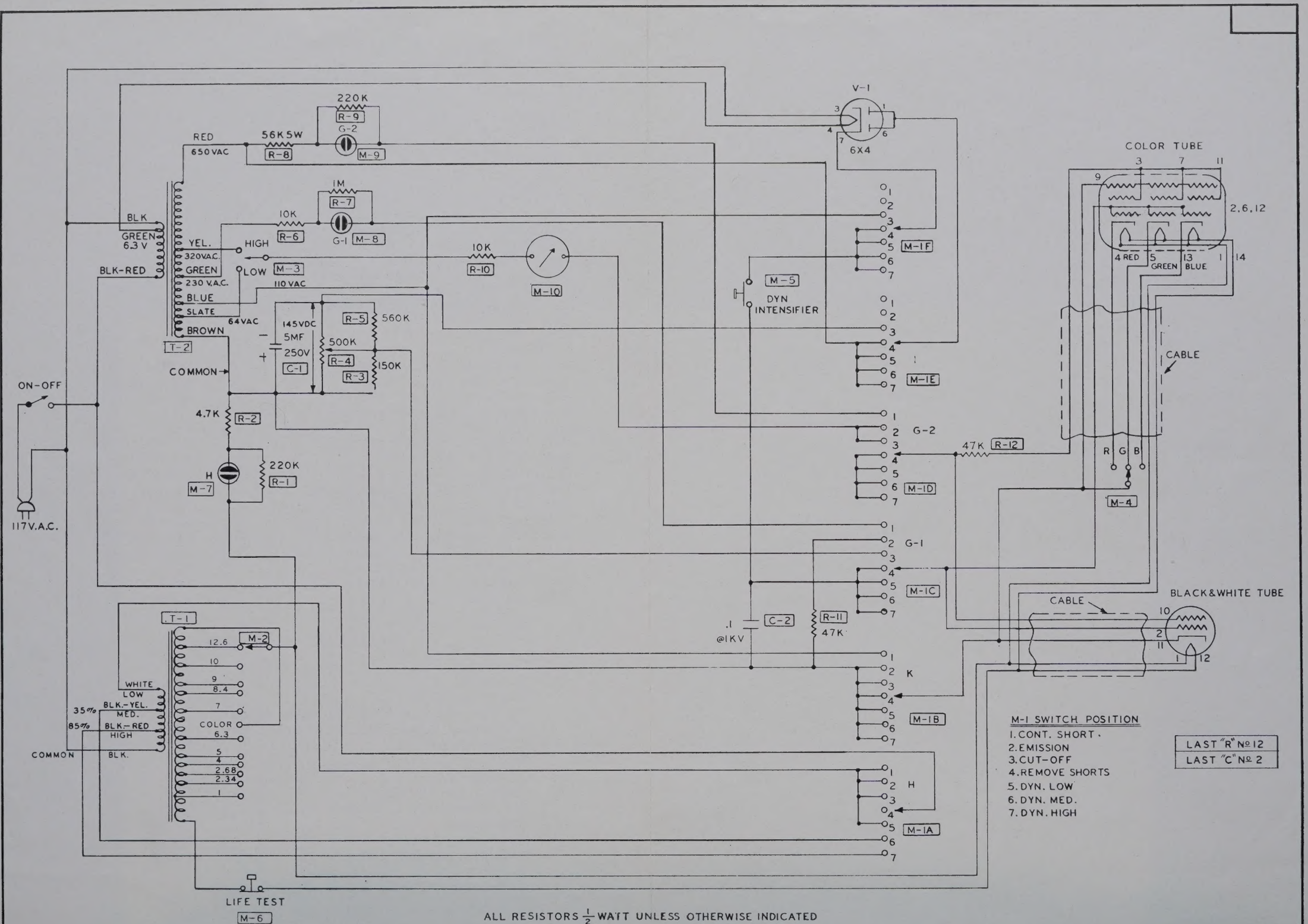
If the emission current is over 300 you have satisfactorily completed the rejuvenation of this picture tube. Once the tube has been successfully rejuvenated, do not try to get more out of the tube by rejuvenating it again as you may destroy the cathode surface. Another Life Test should be made to make sure that there is no excess gas present in the tube.

If the meter still does not read 300 or better, turn the Selector switch to Dynamic Intensifier-Med position—wait 15 seconds—and press the Dynamic Intensifier button momentarily. Go back to the Emission Test position and test the tube again. If the current is now satisfactory, you have completed the rejuvenation. If it is still low, try in the Dynamic Intensifier-Hi position—wait 15 seconds—and press the Dynamic Intensifier button again and rejuvenate the tube in this position. Then test the tube once again. If you cannot bring the emission current up by using the Dynamic Intensifier-Hi position, the tube cannot be repaired and no attempt should be made to do any more to that tube. Any additional attempts at repairing the tube (i.e. increasing the grid opening to increase emission) will have an undesirable effect upon the operation of the tube in the TV set and should not be attempted. NOTE: If you have a



ALL RESISTORS $\frac{1}{2}$ WATT UNLESS OTHERWISE INDICATED

MODEL NO. 440 SCHEMATIC

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comparatively new tube (less than 90 days old) which has become weak, it is probably a result of excess gas content. It is not generally advisable that you attempt rejuvenation of such a tube.

REPAIRING OPEN ELEMENTS

If the Continuity test shows an open G1 or G2, the probable cause is a bad solder connection at the base pins. For an open element, the first step is to try resoldering the pins on the base of the picture tube. If the Continuity test shows an open cathode, it may actually be a break in the weld between the cathode and its connecting tab, or very weak emission from the cathode. First try restoring the emission, as discussed in the preceding section. If that does not work, you can attempt to weld the cathode tab as follows: Turn selector switch to Dynamic Intensifier-Hi position. With the non-metallic handle of a screw driver, tap lightly on the neck of the tube. Watch carefully as you press the Dynamic Intensifier button for a few seconds. If the weld takes, you will see a bright flash. Test the tube for continuity. If the continuity is good, check the tube for emission.

WARRANTY

Your CRT MODEL 440 is made of the finest material and then carefully tested at the factory before shipment. It carries the standard RETMA warranty against defects in material and workmanship for a period of 90 days from date of purchase. Should any defect be discovered within this warranty period, return the unit to the distributor from whom it was purchased.

BE SURE TO MAIL YOUR WARRANTY REGISTRATION CARD IMMEDIATELY TO REGISTER YOUR UNIT WITH THE FACTORY.

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